Understanding Drug Abuse and Addiction

Steve Hanson
Acting Associate Commissioner,
Division of Treatment
NYSOASAS

shanson1@rochester.rr.com
Basic Questions

• Why do people do drugs?
• Why can’t/won’t some people stop?
Realities
People like Drugs.
We all like things faster and easier.
How Drugs Work

• Interact with neurochemistry
• Results:
  – Feel Good – Euphoria/reward
  – Feel Better – reduce negative feelings
Although persons may choose whether or not to initiate the use of psychoactive substances and/or alcohol, drug dependence is an involuntary result.
Voluntary Drug Use

Compulsive Drug Use (Addiction)
Addiction is a Brain Disease

Prolonged Use Changes the brain in Fundamental and Long Lasting Ways
Drugs Have Long-term Consequences
Simple Brain Structure

• Frontal Lobe (Cortex)
  – Judgement and reason

• Mid brain (Limbic)
  – Emotions and reward sites

• Hind brain (Stem)
  – Bodily functions
Neurotransmitter Action

Release of NT

Reuptake

Receptor
Awake, Powerful, Euphoric, Sexy

Depressed, Powerless

Crash
The Reward Pathway and Addiction
Natural Rewards

Food
Water
Sex
Nurturing
Music
Activation of the reward pathway by addictive drugs

- alcohol
- cocaine
- heroin
- nicotine
- methamphetamine
- marijuana
- ecstasy
- opium
- etc.
Food

Source: Di Chiara et al.
Sex

Source: Fiorino and Phillips
Nicotine

The graph shows the % of basal release of nicotine in the Accumbens and Caudate regions over time after nicotine exposure. The x-axis represents time after nicotine (0, 1, 2, 3 hr), while the y-axis represents % of basal release (0-250).
Effects of Drugs on Dopamine Levels

Source: Di Chiara and Imperato
Methamphetamine

Source: Di Chiara and Imperato
Behavior Pathways

- Rewarding behaviors can become routine
- “Subconscious” control of the behavior
- Difficult to extinguish behaviors because people are not always aware when they are initiated.
- Resistant to change
Craving

Amygdala
Circuits Involved In Drug Abuse and Addiction

All of these must be considered in developing strategies to effectively treat addiction.
Go & Stop

- Craving elicits **Go!!**
- Powerful
- Activity in limbic system not frontal cortex
- Feeling/reacting vs. thinking/planning
- Thinking initiates **Stop!!**
- Addicts have “bad brakes” — **Stop!**
- Hard to stop this fast moving car.
Craving

Trigger → Memory → Stimulation of Nucleus Accumbens & Amygdala

Focus on Drug → Anxiety Increases

Relapse

Impaired Judgement
AMYGDALAR CONNECTIVITY during brief .5 sec Cocaine Cues

Drug 2  
amyg conx 
(n=7)

Baclofen blunts AMYGDALAR CONNECTIVITY

Source: Childress, et al, unpublished
Myelination

Why it’s hard to change
In the beginning the brain is like a virgin forest, filled with opportunities for development.
Initially the paths are rough, and the nerve impulses travel slowly
As the activity on the path increases (learning) the pathway becomes paved, allowing faster traffic.
With repetition the pathways become like the Autobahn.
Get High

Stress Problems

Get Help

Go to Meeting

Call Sponsor
Chemical Dependency

• Chronic Disease Prone to Relapse
• Requires significant behavior changes
• Similar to Heart Disease, Diabetes, Asthma, Gingivitis, etc.
• Similar treatment “success”
Relapse Rates for Drug Addiction are Similar to Other Chronic Medical Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percent of Patients Who Relapse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug Dependence</td>
<td>40 to 60%</td>
</tr>
<tr>
<td>Type I Diabetes</td>
<td>30 to 50%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>50 to 70%</td>
</tr>
<tr>
<td>Asthma</td>
<td>50 to 70%</td>
</tr>
</tbody>
</table>

Relapse Happens

- Poor Craving Management
- The Relapse Process – Gorski
- Get the train back on the tracks
Cocaine Effects - Euphoria

• Blocks Reuptake of DA and NE – increases activity
• Central Nervous System - Euphoria
• Peripheral NS - ↑ NE Fight/Flight
  • ↑ HR, BP, Temp, bronchodilation, dilates pupils
Snorted - onset 2 mins.

Smoked - onset 5-12 seconds
30-40 mins

Snorted - onset 2 mins.

5 mins

15 mins 1 hour
Dose Response

DOSE

EFFECTS

Energized

Euphoria

Anxiety

Paranoia

Psychosis

Metabolic Crisis
<table>
<thead>
<tr>
<th>Duration</th>
<th>Dose</th>
<th>Interval</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 hours</td>
<td>X</td>
<td>30 mins</td>
<td>Normal Routine</td>
</tr>
<tr>
<td>10 hours</td>
<td>3X</td>
<td>15 mins</td>
<td>↓Eating, Drinking 4 wks 90% Die</td>
</tr>
<tr>
<td>23 hours</td>
<td>3X</td>
<td>Unlimited</td>
<td>Dead in 5 days</td>
</tr>
</tbody>
</table>
Cocaine Craving

Populations (Cocaine users vs. Controls) x Film (erotic vs. cocaine)

Garavan, et. al., A. J. Psych 2000
Stopping Cocaine Use

• Anhedonia - Dopamine depletion
• Craving - intense craving for drug
Methamphetamine

• Popular in 1960’s - Hell’s Angels
• Crystal / Crank - snortable - 1980’s
• Ice - smokeable form -1990’s
• Started in Hawaii - California - Midwest
Making Meth

- Internet recipes
- Cold medication – pseudoephedrine
- Iodine, ammonia (fertilizer), red phosphorus (match strike plates and flares)
- Rock salt, drain cleaner, solvents etc.
- Toxic fumes and waste
- Or…Just buy the good stuff from Mexico
Forms of Methamphetamine

**Methamphetamine Powder**

Description: Beige/yellowy/off-white powder

**Base / Paste / Peanut Butter**

Description: ‘Oily’, ‘gunky’, ‘gluggy’ gel, moist, waxy

**Crystal / Ice / Tina**

Description: White/clear crystals/rocks; ‘crushed glass’ / ‘rock salt’
Methamphetamine

DOPAMINE

DOPAMINE
Meth - Signs of Abuse

- rapid weight loss
- nervous energy
- no “need” for sleep
- aggressive

- mean temperament
- compulsive
- excited talk
- “Meth mouth”
Eroding the Mind
Researchers have mapped brain decay caused by methamphetamine use. The damage affected memory, emotion and reward systems.

Average difference in brain tissue volume of methamphetamine users, as compared with non-users:

Source: Dr. Paul Thompson, U.C.L.A.
Meth - Signs of Withdrawal

- long crash
- apathy
- depression
- fatigue

- anxiety
- suicidal ideation
- cravings
Alcohol

• Most popular drug of abuse
• Probably the most physically toxic of drugs
• Damages almost every organ in the body
• Easy access, adults use, advertising, relatively inexpensive.
• THE DRUG for Youth
Action

- Dopamine – excitement & reward
- Serotonin – feel – “normal”
- GABA – lowers anxiety
- Endorphins – pain relief, reward, craving
Endorphins

Craving

Endorphins

Stop Drinking

Reward

Block Endorphins with Naltrexone
- Break Reward Cycle
Opiates

• Dates to 4,000 BC
• Mimics endorphin activity
• Natural - Opium, morphine, codeine
• Semi-synthetic- Heroin, Dilaudid, Oxycontin
• Synthetics - Darvon, Demerol, Fentanyl,
Opiates

- Heroin more potent -60-80% - <10% in ‘70’s
- Younger age group - High School
- Users start with snorting - IV within 12 months
- Withdrawal painful - not deadly
- Lots of Relapse
Prescription Opiates

- OxyContin—an oral, controlled release form of the drug—Much abuse—crush the tablet—heroin-like high
- Darvon
- Vicodin
- Dilaudid
Two “Types” of Rx Drug Abusers

• The Drug Abuser who likes Rx drugs.
  – Frequently use other drugs (cocaine, alcohol, heroin, other non-Rx drugs)
  – Fits the “model” of a drug abuser.
  – “addicted” to high

• The Patient who becomes dependent on their medication
  – Infrequent use of other substances – unless can’t get Rx.
  – Don’t fit “model” of drug user – age, other behaviors.
  – “dependent” on the drug
Why Prescription Drug Users May Believe That They Are “Different”

• “I had/have real pain, I wasn’t using these to get high like those drug addicts”
• “My doctor prescribed these for me. It wasn’t my idea”
• “I never robbed anyone or did those things that addicts do.”
• “I have to take something for this pain!”
What the Rx Drug User Might Have Trouble Relating To

- “Hitting Bottom”
- Changing People, Places & Things
- Change your “Lifestyle”
- You must be completely abstinent from everything else – alcohol included
- Going to meetings all of the time.
Marijuana

• Used since 2,700 BC
• More potent today (5-10X) than ‘70’s
• Kids starting younger
• Eliminates boredom, focus concentration, lowered anxiety, euphoric, increased appetite.
Spice/K2 and Synthetic Cannabinoids
“Listed” Ingredients in Spice

- *Canavalia rosea*: beach bean or bay bean
- *Nymphaea caerulea*: Blue Egyptian water lily
- *Leonurus sibiricus*: Honeyweed or Siberian motherwort
- vanilla
- honey
Preparation of the “incense”:

• botanicals are sprayed with liquid preparations of:
  – HU-210
  – HU-211
  – CP 47,497
  – JWH-018
  – JWH-073
Origins of Synthetic Cannabinoids

- HU-210 & HU-211 - synthesized at Hebrew University, Israel in 1988. HU-210 is an anti-inflammatory; HU-211 as an anesthetic.
- CP 47,497 - developed by Pfizer in 1980 as an analgesic.
- JWH-018 & JWH-073 - synthesized by a researcher at Clemson (1995) for use in THC receptor research - John W. Huffman.
- More than 100 different synthetic cannabinoids have been created.
Pharmacological Effects of Synthetic Cannabinoids are Similar to THC

- increase heart rate & blood pressure
- altered state of consciousness
- mild euphoria and relaxation
- perceptual alterations (time distortion)
- intensification of sensory experiences
- pronounced cognitive effects
- impaired short-term memory
Reported Effects of Synthetic Cannabinoids are Different to THC

- production inconsistencies
- herbal incense blends are harsher to inhale
- increased restlessness & aggressive behavior
- herbal incense produces a shorter “high” (perceptual alterations & sensory effects are limited)
- doesn’t mix well with alcohol (hangovers)
- incense costs more than marijuana
Legal Status of Synthetic Cannabinoids (DEA)

• March 1, 2011, the DEA, issued final notice to temporarily place five synthetic cannabinoids into the Controlled Substances Act (CSA) for at least one year

• synthetic cannabinoids treated as Schedule 1 drugs
  – a drug that has a high potential for abuse
  – a drug that has no currently accepted medical use in treatment in the United States
  – there is a lack of accepted safety for use of the drug under medical supervision
Bath Salts
Bath Salts:

- Ivory Wave
- Ivory Pure
- Ivory Coast
- Purple Wave
- Vanilla Sky
What’s in Bath Salts

• Methylenedioxypyrovalerone (MDPV) is a psychoactive drug with stimulant properties which acts as both a norepinephrine-dopamine reuptake inhibitor (NDRI).
• MDPV has four times the potency of Ritalin
• MDPV - no history of FDA approved medical use
• sold since 2007 as a research chemical
Pharmacological Effects of “Bath Salts”:

- increase heart rate & blood pressure
- pupil dilation
- hyperactivity, arousal & over stimulation
- increased energy & motivation
- euphoria - agitation
- dizziness
- nausea
- breathing difficulties
- diminished perception of the requirement for food and sleep
Early Recovery Issues

- Loss of lifestyle
- Loss of Coping Strategy
- Withdrawal
- Cognitive deficits related to early abstinence
Cognitive Deficits

• Memory problems - short term loss
• Difficulty with abstractions
• Difficulty with impulse control
• Similar performance to those with brain damage - improves.
Addiction is like...
A dog with a bone

- The dog does not want to let go of the bone (addiction/denial).
- It gets excited when it thinks it's going to get its bone (craving)
- It always wants more bones (loss of control)
- Sometimes the dog takes you for a walk.
What Boomer is Thinking

They won’t test me for another week.

What can I get away with?

Try the second-hand smoke excuse.

We can talk our way out of this.
Treatment is like...  

Obedience School for the Dog

• You teach the dog’s owner to control the dog.
• You develop a variety of tools (relapse prevention) to help the dog be obedient.
• Some dogs are harder to train.
Sometimes the dog becomes a wolf